[0093] Referring now to **FIG. 11**, there is illustrated various processes involving impulse reconstruction in accordance with the principles of the present invention. The term "impulse reconstruction" as used herein refers to a process of generating the shape and/or other defining characteristics of the original impulse generated by contact to a touch sensitive substrate. The methodology depicted in **FIG. 11** and in subsequent Figures may be implemented in a variety of touch sensitive device configurations, such as those described above.

[0094] According to **FIG. 11**, pickup sensor signals are generated **300** in response to a contact to a touch sensitive plate. The location of the contact on the touch sensitive plate is determined **302**, preferably by a method that provides for dispersion correction of the pickup sensor signals. Once the touch location is known, impulse reconstruction is performed **304** to effectively reproduce the original shape of the impulse generated by the contact. The reconstructed impulse may then be used for a variety of purposes, including deriving **306** additional information about the original contact event.

[0095] **FIG. 12** illustrates a particularly useful method involving impulse reconstruction in accordance with an embodiment of the present invention. In **FIG. 12**, pickup sensor signals are generated **320** in response to a contact to a touch sensitive plate, and the location of the contact on the touch sensitive plate is determined **322**. Having determined the touch location, impulse reconstruction is performed **324** to generate the original shape of the impulse. The reconstructed impulse is then used to confirm or verify **326** the location of the original contact.

[0096] As discussed previously, touch location confirmation using impulse reconstruction may be employed to achieve a variety of performance enhancements, including, for example, improved rejection of spurious touches to the casing or support structure of a touch sensitive device, improved contact strength determinations, improved accuracy in determining touch location in the presence of ambiguity or noise, improved identification of contact implement type and related properties, and improved rejection of spurious contact data generated by background acoustic noise, among others.

[0097] **FIG. 13** illustrates another method involving impulse reconstruction in accordance with an embodiment of the present invention. According to this approach, pickup sensor signals are obtained **340** in response to a contact event that generates an original impulse on a touch sensitive plate. The location of the contact is determined **342** preferably in a manner previously described. The dimensions or aspect ratio of the touch sensitive plate are/is determined **344**. The dispersion relation of the touch sensitive plate is either determined or known **346**. Using the information obtained in blocks **340-346**, the impulse representative of the original impulse is reconstructed **348**.

[0098] According to one approach to determining the dimensions of a touch sensitive plate, indicated in block **344**, a dedicated excitation transducer may be used to generate bending waves that are sensed by the pickup sensors positioned in the corners of the touch sensitive plate. The excitation stimulus may be either a pulsed stimulus or a wide band noise-like stimulus. The pickup signals output by the pickup sensors may be processed in a dispersive manner, such as by the conversion of each of the pickup signals to one of an equivalent non-dispersive system. The relative distance from the excitation transducer to each of the pickup sensors is computed. An alternative approach for determining relative distance between the excitation transducer and pickup sensors involves the removal of a fixed amount of dispersion for the investigation of first arrival times. In another alternative approach, the excitation signals may be focused on a narrow frequency band and relative arrival times to each of the pickup sensors may be estimated.

[0099] If the absolute dispersion relation of the touch sensitive plate is known or determined by direct measurement, the absolute dimensions of the plate may be computed. If the absolute dispersion relation of the touch sensitive plate is not known, only the relative dimensions of the touch plate may be computed. The absolute dispersion constant of the material of the touch sensitive plate is required to determine the absolute dimensions of the plate since the material properties of the plate determine the absolute velocity of wave propagation across the plate as a function of frequency. Without this knowledge, the touch sensitive plate dimensions are only known in normalized coordinates. Details of various methodologies directed to plate calibration and determining the dispersion relation of a touch sensitive plate, as indicated in blocks **344** and **346** of **FIG. 13**, are described in previously incorporated copending U.S. patent application entitled "Touch Sensitive Device Employing Bending Wave Vibration Sensing and Excitation Transducers," filed concurrently herewith under Ser. No. ______ Attorney Docket 59372US002.

[0100] It is understood that an impulse on a touch sensitive plate propagates outwardly from the contact location in a circular manner according to the following equation:

$$\psi(r,t)=\frac{\psi(0,t)\cdot e^{i(kr-\omega t)}}{\sqrt{r}}$$

[0101] where, Ψ corresponds to a physical parameter such as displacement or velocity, ω is angular velocity, k is wavevector in the touch sensitive plate, and r is the distance from the contact location to the sensing position. The wavevector, k, in the touch sensitive plate is related to the angular velocity, ω, by the following dispersion relation:

$$k(\omega)=\sqrt{\omega\sqrt{\frac{\mu}{B}}}$$

[0102] where, μ refers to the areal density of the touch sensitive plate and B refers to the bending stiffness of the plate. It is noted that, for purposes of clarity, the above equations represent a simplification of the full plate equations, which are more complex due to the presence of flexural near fields.

[0103] From the above equations, it can be seen that the amplitude of the impulse decays with distance, as required by conservation of energy. In addition, a phase factor is applied to the impulse that depends on distance. This phase